Palmer (A. B.) Ford (C. L.) & Earle

A REPORT

UPON THE

EPIDEMIC

OCCURRING AT

MAPLEWOOD YOUNG LADIES' INSTITUTE,

PITTSFIELD, MASS.

IN JULY AND AUGUST, 1864:

INCLUDING A DISCUSSION OF THE CAUSES OF TYPHOID FEVER.

BY

A. B. PALMER, M.D.

Prof. of Pathology, Practice of Medicine and Hygiene in the University of Michigan; and of Pathology and Practice of Medicine in Berkshire Med. College;

AND

C. L. FORD, M.D.

Prof. of Anatomy and Physiology in the University of Michigan and Berkshire Med. College;

AND

PLINY EARLE, M.D.

Prof. of Materia Medica, Psychological Medicine and Hygiene in Berkshire Medical College; and Superintendent of the State Hospital for the Insane at Northampton, Mass.

Re-printed from the Boston Medical and Surgical Journal.

BOSTON:

DAVID CLAPP & SON, PRINTERS.....334 WASHINGTON ST.

1865.

REPORT.

Maplewood Young Ladies' Institute, a well-established and popular boarding school, at Pittsfield, Mass., has lately been visited by a violent outbreak of sickness, bringing prominently before the medical profession and the public various questions connected with its sanitary condition.

During the latter part of July, 1864—from about the 23d to the 29th—five persons were attacked with a severe form of disease; and during that period, and up to the 10th of August, when a regular term ended and the school was closed, some thirty others were sufficiently indisposed to require the advice of a physician. There were, at the time, 77 young ladies, from many of the Eastern, Middle, and Western States, who were boarding, lodging and receiving instruction in the institution. Besides the Principal and his immediate family, seven or eight teachers resided in the establishment. The whole family, including servants, consisted of about 112 persons. There were, in addition, quite a number of young ladies and misses, residents of the town, who attended the exercises of the school as day pupils, lodging and boarding at their homes.

Of the five persons taken seriously ill, as before mentioned, one was a teacher, who recovered after a long and severe sickness; but the other four, three of them pupils and the other a servant girl, died. The first death was of the servant girl, and occurred on the 2d of August. The three pupils died, respectively, on the 3d, 7th and 10th of that month.

At the close of the term, on the 10th, the pupils hastily dispersed—a few leaving before that time; but many were so seriously indisposed at the time of leaving that they performed their journeys home under the influence of quinine and alcoholic stimulants; while one, too ill to leave, remained sick for some time in the Institute, and two others proceeded no farther than to a private house in the

immediate neighborhood, where they each suffered from a severe and protracted illness, but ultimately recovered. A week or two after the close of the term, two young ladies, day scholars residing in the village, were attacked in a manner similar to the others. Two or three servants connected with the Institute family were also attacked, and one of them died. Numerous reports of sickness and death among those who had left were shortly afterwards received; articles on the subject were published in several newspapers, and the public were profoundly agitated with sympathy, curiosity, anxiety and alarm.

The large proportion of the pupils reported to have been attacked, and the unusual severity and fatality of the cases, pointed to some local cause at the Institute. The time for the opening of the next term approached. No one conversant with the facts could think of sending a daughter to a place so apparently infected, until the subject had been investigated. Under these circumstances, the trustees of the school assembled on the 16th of September, and recommended that the Principal should "consult the best medical authority within his reach, and immediately take the most efficient means to remove not only any local cause which may be shown to have been developed by the remarkable heat and drought of the last summer, but also any cause which may be suspected by said authority to have had any influence in occasioning said disease." On the following day two of the undersigned were requested, in a note from the Principal, to act in accordance with the advice of the trustees, as a committee of investigation and direction; and at their request the third was added to their number.

On the 20th of September the committee commenced their investigation, and, accompanied by two physicians of Pittsfield, visited the premises; and on this and repeated subsequent occasions examined every part without the buildings and within, observing all conditions as they then were, and, with much pains and labor, taking testimony from a large number of persons as to all conditions, previously existing, which were deemed capable of affecting the health of persons brought within their influence. These conditions will be hereafter detailed. A few days afterwards, having been furnished by one of the teachers of the school with the names of the ninety-two pupils who had been in attendance during the summer term, they addressed the following circular either to the pupils themselves or to their parents or guardians.

"PITTSFIELD, MASS., Sept. 19th, 1864.

"The undersigned have been appointed a committee to investigate the causes which may have produced the recent sickness among the inmates of Maplewood Young Ladies' Institute, and wish to learn, definitely, the amount and character of that sickness. They therefore respectfully solicit full, explicit and immediate answers to the following questions:—

"How long did Miss —— reside at Maplewood, and what was the date of her leaving?

"Was she ill during her residence there, or has she been ill since she left?

"If ill, when did the sickness commence?

"What was the character and duration of such illness?

"What was the result of the sickness?

"To what causes, here or elsewhere, do you attribute such sickness?

"At the time of her illness was a similar disease prevailing in her neighborhood?

"Please address, without delay, Dr. A. B. Palmer, Pittsfield, Mass.

"A. B. Palmer,
"C. L. Ford,
"Pliny Earle,
} *Professors in Berkshire Medical College.*"

They also addressed the following circular to each of the physicians of Pittsfield:—

"Dear Sir,—The undersigned, a committee to inquire into and ascertain, if possible, what causes may have contributed to the serious illness which has prevailed among the pupils of Maplewood Young Ladies' Institute, would respectfully request such information as you may be able to impart concerning the diseases which have prevailed, and your views as to the probable causes of such disease. Both humanity and science seem to demand a careful inquiry into the causes of such a calamity.

"Very respectfully, A. B. Palmer,
C. L. Ford,
Pliny Earle."

For the purpose of presenting some facts in the order in which they occurred, and because subsequent events seem to make this statement necessary, we would here say, though somewhat out of logical order, that during the time which had elapsed between the closing of the term, on the 10th of August, and our visit of inspection on the 20th of September, great changes, in accordance, it is alleged, with previous plans, had been effected at Maplewood. The old corridors, to which we shall hereafter refer, had been replaced by entirely new ones, lighted, elevated and much improved in construction. The privies or vaults, hereafter to be described, had been completely removed, even to their foundation stones, together with the earth which was around them, and their places obliterated by freshly-drawn earth, while others of proper construction had been substituted. Some new drains had been dug, and a large and deep cesspool, at a considerable distance from the buildings, was being constructed to receive the slops of the kitchen, the chambers and the laundry.

The ground near the buildings from which a barn had been re-

moved during the warm season, had been for the most part deeply covered with fresh clean earth. An offensive pool in the barn-yard had been filled up. The whole premises had been thoroughly cleansed, lime had been freely scattered about, the buildings within had been well washed, ventilated and disinfected by lime, and the furniture freely exposed to air and light.

After being satisfied that these improvements would be persisted in, and besides, that in accordance with their suggestion, the foliage in some places should be removed for a free admission of light and air; that the laundry drain should open into a capacious cess-pool, instead of having any portion of its contents flowing upon or near the surface; that the chamber slops should be conveyed to the distant large covered cess-pool, instead of being thrown, as before, into the vaults; that the hot-air furnaces, some of them supplied from the cellars with air to be heated and sent into the rooms, should be provided with cold-air flues duly opening externally; that the cellars where vegetables were kept should be plastered overhead, and ventilated by flues running into chimneys, the following paper was given to the Principal by the committee:—

"PITTSFIELD, MASS., Sept. 22, 1864.

"Having, at the request of the Principal of Maplewood Institute, thoroughly inspected the buildings and premises of that institution with reference to its sanitary condition, we are prepared to express our unanimous opinion that with the improvements already completed and in progress and soon to be completed, the school may be opened at its usual period in October, with every prospect of the salubrity of former years."

Signed by the committee.

From a circular recently issued, the committee are gratified to learn that no case of sickness has since occurred in the Institute.

The committee have deemed this narration of their proceedings important to be taken in connection with the more material statements which are to follow, giving, as it will, a proper view of their course and the care with which they proceeded in a matter involving so many and such important interests.

Of the ninety-two pupils to whom the first circulars were sent, it was subsequently ascertained that fifteen had not been in attendance during the last four weeks of the term, most of them having left on account of ill health—several having had measles at the school.

Our special inquiries, therefore, embraced seventy-seven pupils—the entire number who boarded and roomed in the seminary buildings during the last month of the term. Replies to the circular were received from seventy-four pupils, or their friends; and from these replies it appears that fifty-one have had typhoid fever, including those cases of pupils residing in the house, already referred to. The disease has been pronounced "typhoid fever," with singular uniformity, from sources widely remote, in the many distant homes to

which the pupils repaired. Three or four were reported of a mild form, such as would be called, by some authors, "abortive typhus"; but a very large proportion of the cases are represented as severe in form, and continuing for several weeks. Of the twenty-three not reported as having had typhoid fever, nine or ten had, in a milder form, premonitory symptoms, which speedily yielded to treatment; one had dysentery; one reported "slow fever"; one, "anæmia"; two, "unwell," nature of case not stated; and eight reported themselves as "well" in the Institute, and for a short time afterwards. Of the 51 cases of typhoid fever among the pupils, 13 terminated fatally, or about 25·5 per cent. The remainder have more or less perfectly recovered.

The very large proportion of so great a number of persons being ill and having typhoid fever within so short a period, points unequivocally to something peculiar in their condition; to their exposure to noxious influences of some kind, either in their locality, their diet, or their habits. This will be more strikingly seen when the sanitary condition of these persons is compared with that of the community at large by which they were surrounded. Of the 74 resident pupils heard from, 66 are reported as having had illness of some kind, at the close of the school or soon after. This is a proportion of $\frac{66}{74}$, or nearly 90 per cent. Of these same 74, 51 had typhoid fever, or a proportion of nearly 69 per cent. If all the people in the town, say 8000, had been affected in an equal proportion, more than 7000 would have been ill during these few weeks, and about 5500 of them would have had typhoid fever; and of these, over 1375 would have died. If it would be a more just comparison to take the whole family at Maplewood into the account, estimating the number at 112, 56 had typhoid fever, or 50 per cent.; and of these 56, 16 died, or over 28·5 per cent. These proportions applied to the whole population of 8000, would give 4000 of typhoid fever in the same time; and of these, 1140 would have died. According to the testimony of the practising physicians of Pittsfield, the number of cases of real typhoid fever, during this period, aside from those affected by the influences at Maplewood, was small, some physicians not having had any, others having had two or three.

From a perfectly reliable medical gentleman of the town, the committee have received the following statement:—"I have seen all the regular physicians, and requested them to give me the exact number of typhoid-fever patients they treated about the time of the Maplewood sickness—that is, during the month of August. Dr. R. says he had two; Dr. S., three; Dr. A., in full practice, says, 'outside of Maplewood, not one.' Dr. C., aside from pupils and servants of the Institute, one; Dr. B., besides two young ladies who were day scholars at the Institute, two." These, it will be seen, make in all but eight cases; and so far as the committee are informed or believe, none of them terminated fatally. The town records

show that at other portions of the season—or at least between July 1st and December 1st—five or six deaths were reported from typhoid fever, about the same number as the year previous; but all of the cases occurring during the month of August, when the Maplewood sickness prevailed, seemed to result favorably.

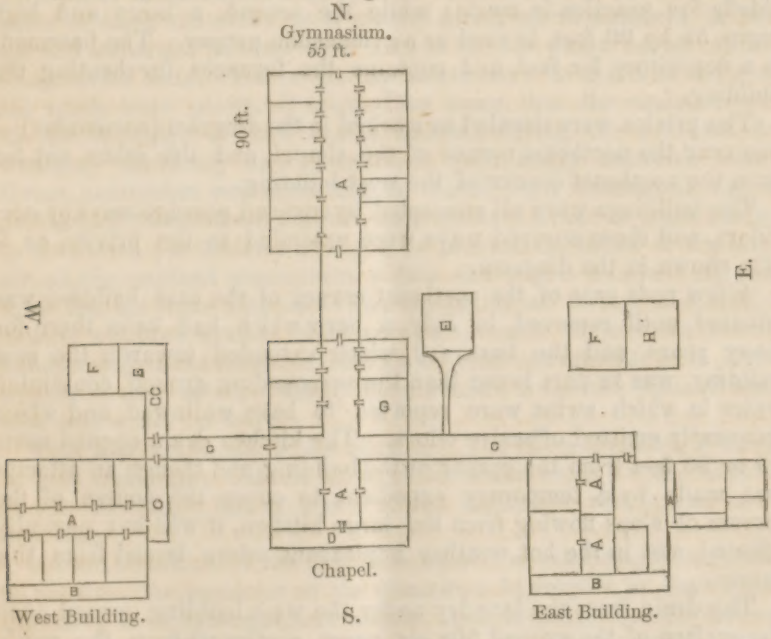
This comparison is sufficient to dispose of the question as to some peculiar and special cause or causes having operated upon these persons, and must go far towards riveting the conviction, in all unprejudiced and properly informed minds, that these causes were local. It is proper to state that the committee have not doubted this since the first day of their formal investigations; but still they have endeavored, and they think successfully, to pursue these investigations with all the care and impartiality that they would have exercised had this fundamental point been with them still an open and doubtful question. The great questions still remaining, to which science and humanity both demand an answer, are, 1st, what is the cause or what are the causes of this extraordinary and really appalling sickness? and, 2dly, by what means, under similar circumstances, could such a calamity be prevented? In view of the numerous and most respectable parties, the patrons of this popular institution, scattered over a large portion of our country, who have a special interest and right in this matter, and who request to know; and particularly in view of the vast interests of science and humanity, all personal and private considerations sink into utter insignificance, and the exact and entire truth, so far as it is possible to ascertain it, must be fully and plainly told. All the light which it is possible to obtain should be thrown upon the most important questions above stated.

In making inquiry into the causes of this disease, the topography of Maplewood, the character and position of the buildings, and all their surroundings, require attention.

The town of Pittsfield, Berkshire Co., in which the Institute is situated, is one of the most elevated, and has been regarded as one of the most healthy places in Western Massachusetts. It is in a broad valley, several miles in each of its diameters, but not of much depth, and where but a moderate portion of the soil is at all alluvial. The soil is generally gravelly and porous, the rocks granitic and calcareous, the surface finely undulating, traversed by running streams which propel the machinery of numerous manufacturing establishments, and swell occasionally into abruptly margined lakes. Within this valley, on the northwest side of the village, and from half a mile to a mile beyond Maplewood, the principal mill-stream runs for some distance a little more sluggishly in its course, and its margin consists of a level meadow of considerable extent, partaking somewhat of the character of a marsh. It has not, however, hitherto been generally regarded as a source of malarial disease; and people living more immediately upon its margin have not been observed to be

more sickly than those in the town. The village is supplied with water, reputed to be of very pure quality, from the distant hills on the southeast side. It is brought through an aqueduct, and has generally given satisfaction to the inhabitants. The village, containing about 5000 inhabitants, is not compact, excepting the business buildings in its centre. Most of the dwellings are isolated, and surrounded by ample grounds. It should be mentioned, however, that in many parts there is a superabundance of shade trees, and that there is no system of pavements, or of sewerage, or underground drainage. Still, as is very justly observed in the catalogue of Maplewood, "For salubrity of climate, beauty of scenery and environments, of hill and valley, Pittsfield can hardly be surpassed. The long ranges of the Hoosic and Taconic Mountains on the east, south and west, with Saddle Mountain on the north, enclose a valley of great fertility, appropriately denominated and well known as the 'garden of the Bay State.' In the centre of this valley, on a gentle elevation overlooking the town, towards the south, and the country far and wide, stand the buildings of the Institute, presenting, especially from the lofty observatory attached to the gymnasium, a commanding and inspiring prospect."

A ground plan of the buildings of the institute is here annexed.



A, Halls. B, Piazzas. C, Corridors. CC, Ladies' Corridors. D, Portico. E, Commodes. F, Sheds. G, Cabinet. H, Cottage.

In the central building, consisting of two stories and a cellar, the first floor is occupied for recitation rooms, cabinet, &c., and the se-

cond as a chapel and general study room. The cellar contains furnaces, coal, vegetables, &c. On either side of the chapel is a building consisting of three stories over a cellar. That upon the east is called the "east building"; the other, the "west building." To the east building is attached a wing of two stories, with a basement. The basement of this wing, together with a part of the cellar or basement of the main building, is occupied as a kitchen and store-rooms; the other part as a cellar proper, containing coal and accommodating furnaces for heating the parts above. The first floor of this building, above ground, is occupied for parlors, library, dining room, and the apartments for the family of the Principal. The two stories above are used as dormitories for the pupils—a lady teacher occupying one room on each floor. A hall passes through the centre of each of these stories, from east to west. The rooms of the pupils are upon sides of the halls, opening into them and receiving their heat from them in cold weather. The basement of the west building is occupied as a laundry; and the other three stories, as dormitories, arranged as in the two upper stories of the east building, and as shown in the diagram.

The gymnasium is situated in the rear of the chapel, and consists of two stories and a cellar, or basement. The first floor has rooms chiefly for practice in music; while the second, a large and high room, 55 by 90 feet, is used as a gymnasium proper. The basement is a depository for fuel, and contains the furnaces for heating the building.

The privies were situated as marked in the diagram (commodes)—one near the northeast corner of the chapel, and the other not far from the northeast corner of the west building.

The buildings were all connected by covered passage-ways or corridors, and these covered ways were extended to the privies, as is also shown in the diagram.

A few rods east of the northeast corner of the east building was situated, until removed in July, a barn which had been there for many years, and the barnyard, which extended towards the east building, was in part lower than the surrounding ground, containing water in which swine were reported to have wallowed, and which frequently emitted offensive odors. The kitchen drain opened some 80 or 90 feet from the corner of the building, and though an attempt was made by a temporary expedient to cover the course of the stream of slops flowing from the large kitchen, it was but partially effected, and in the hot weather unpleasant odors issued from this source.

The drain from the laundry under the west building opened upon the surface of the ground fifty-six paces southwest from the southwest corner of the building, and thirty feet from the sidewalk of the public street; and the water from it, after being detained and partially absorbed, as alleged by the Principal, in a large covered cess-

pool, issued at the point before mentioned, sometimes at least in a condition to annoy those who passed in its vicinity. The committee observed a small cess-pool near this point, but it appeared not to have been recently used as a receptacle at the time of their investigation.

The vaults of the old privies, which had both been removed when the committee made their inspection, were represented to them as having been shallow, and filled nearly to the surface of the ground with semifluid materials, as they were the receptacles of the slops from the chambers.

One of them was once cleaned out at night in the course of the hot season of last summer.

For a knowledge of the condition of these vaults, of the openings of the kitchen and laundry drains, of the cellars, and of the cleanliness of the whole premises, the committee are entirely dependent upon the testimony of others, as so radical a change had been made when the investigation commenced; and they hold themselves responsible only for a fair statement of the general current and weight of that testimony.

Although there is not perfect accordance among those who have voluntarily made statements, or have been interrogated, yet there is quite as much unanimity as is usually found where numbers of honest and impartial persons bear witness to the same series of like complicated facts. Hence the committee have no doubt of the general truth, most positively alleged by many, that the vaults, as well as the openings of both drains, emitted, during the hot and dry weather, decidedly and sometimes exceedingly offensive odors. Great annoyance was often felt, as stated by a teacher, at the indelicacy of these odors, and not unfrequently windows were obliged to be closed, particularly at night, to prevent the influx of the outer air, as the confined atmosphere within the rooms was less offensive than the air from without. The testimony as to the necessity of closing windows against offensive odors, comes to us from sources hundreds of miles apart, in letters, in oral statements from living witnesses, and, as reported by their friends, from the lips of those who will speak no more.

This was stated not of one room only, but of several, and of rooms in both buildings; and not alone of the windows of the dormitories, and in the night, but of some of the recitation rooms, and in the day time.

As the condition of the privies is a point so exceedingly important in the case, the inquiries of the committee in respect to that condition have been extended and minute; and, to show that the testimony at least justifies the preceding statements, a few quotations from the letters of pupils and others who had been at Maplewood, and wrote from the evidence of their senses, are added. These letters are in answer to definite interrogations on the subject. The embar-

rassment which the committee, and especially the only accessible witnesses, have felt in pursuing this matter, will readily be appreciated, and the necessity of making special inquiries will be understood. One of the pupils, in her communication, says:—

"Since you request it, I *will* be perfectly frank and plain, feeling assured that you can understand and appreciate the unpleasantness of discussing such a matter in so free a manner; but I, with you, think the cause demands it, and am willing to sacrifice my own feelings, to almost any extent, for the purpose of throwing a little light on so dark a question."

She continues:—"There certainly was an unpleasant smell about the west building. We did have reason to complain of our rooms being very offensive at times. Indeed, the air was often so foul that we found it necessary to close both doors and windows, and this during the warmest of the weather, too. Perhaps you are not aware that there are no vaults proper* connected with the west building. If you could see the internal arrangements of this department, your only wonder would be how it happened that we did not all die of some pestilential disease. The smell that used to come up from that place, those hot July evenings, was enough to breed a fever in one night. All the slops, &c., from the rooms were deposited in these places. This I know to be a fact, for I have seen it done. These places were seldom if ever cleaned, and what their condition must have been you can imagine, I'm sure. Now, do you wonder what the stench meant, where it came from, or what caused it?"

The following is from one who roomed in the east building:—

"You ask if my room was rendered unpleasant by any peculiar odors. I have repeatedly been obliged to close my window on account of unpleasant odors, not only in the day time but particularly at night. I have risen, after retiring, to close it—the odor being almost suffocating. It seemed to proceed from the vaults and an old barn near my window, which had just been removed, leaving the cellar exposed."

The next is an extract from a letter received from the mother of one of the pupils who died at Maplewood:—

"I cannot convey to you a correct idea of the state of the air in the hall of the west building, unless I state the fact that I asked my daughter, the morning after my arrival, if there was not a water-closet on that floor. She replied, 'No—the smell you notice comes from the privies.'"

The following is an extract from a letter from the father of a teacher who died a few days after reaching home:—

"Her mother informs me that she complained of the privy as being very offensive, and that they cleaned it out in one of the warmest

* This is understood to mean that the excavations were so shallow that they could not properly be called vaults, and, as elsewhere expressed, were so filled as not to give the appearance of vaults.

nights, and the odor was perfectly dreadful, and that she believed it had something to do with the sickness. This was said on the evening of her arrival home."

In order to give a fair and impartial hearing of the whole case, it is proper here to state that in a communication from the Principal, received after the foregoing statements were submitted to his inspection, he furnishes the testimony of three witnesses, all of which is inserted.

The first is one of his lady teachers, whom he quotes as saying:—"I was never inconvenienced by offensive odors, and do not remember to have heard complaints from those occupying rooms in the same building with myself (the east building) implying a necessity for closing doors and windows. If any such case existed, it was not known to me."

The next is one of the physicians who visited patients in the institution, and who is quoted as saying:—"I never perceived the effluvia from either vaults or drains in the rooms of the pupils, only in the corridors and main hall of the chapel. I have never perceived the odors from the outlets of the drains, either in North or First street."

The third witness is another medical attendant, and who is reported as stating:—"In all my many visits to Maplewood during the past summer, I did not at any time, so far as I recollect, discover any odor from the vaults or drains of the institution in the dormitories of the pupils, nor did I ever discover any such odors in North or First Street. All the odor I discovered was in passing through the corridors when the doors leading to the privies were left ajar. Furthermore, I never heard from any one any intimation that such odors had been noticed, or were noticeable, until the panic occurred as the result of the cases of sickness last summer." The Principal adds that other similar (negative) testimony could be adduced.

In justice to those who have given more *positive* testimony, and for the purpose of obtaining correct notions of the facts, it should be observed that the language of the first witness quoted is very guarded, and, undoubtedly, like the evidence of all the rest, was entirely conscientiously given. She was not "inconvenienced by offensive odors." She does not say they were not perceived. She does not remember to have heard complaints from those in the "same building" "implying a necessity for closing doors and windows."

We know that individuals differ much in the acuteness of the sense of smell; and it does not appear how acute this sense was in these particular witnesses; neither does it appear how far pupils were encouraged in complaining to their teachers, or how far their modesty and delicacy would allow them to complain to others, especially to gentlemen, of offensive odors of this kind.

Whatever may have been the condition of this sense in the medical gentlemen as the result of their professional training and their

experience in sick rooms, they both testify that odors were discovered in the corridors, and one remembers to have observed them in the chapel hall; and those corridors in which all admit the existence of bad odors, led to the halls and dormitories of the pupils; and the tendency of such air to ascend and permeate the entire building need not be stated. Not without interest in connection with this subject is the ascertained fact concerning the occupants of the southeast corner room in each story of the west building, the rooms most directly connected with such sources of contamination. The lower room was occupied by three, all of whom were dangerously sick, and one died. The two who occupied the corresponding room of the second story had a severe and protracted fever; while the teacher and her sister who occupied the room in the third story directly over these, both died.

For whatever reasons these pupils refrained from complaining to teachers and others of these odors, they did complain to the committee, as their numerous communications show; and not, it may be suggested, as the result of panic (for many of them wrote weeks and even months after the events so unparalleled in the history of local epidemics, and so calculated to produce excitement, had occurred), but from an unpleasant knowledge of the facts, and from a sense of duty to the cause of humanity, truth and science.

It is not impossible, indeed it may be regarded as probable, that in some instances statements were strongly made (the strongest are not in the report), and it seems quite likely to the committee that with some the exceptional cases of very bad smells dwelt most vividly in the memory, and found expression in language not altogether free from the coloring of emotion; but, after making all proper deductions, there must have been an amount of perceptible offensiveness, often quite uncomfortable and annoying to the inmates. A conviction of the extensive prevalence of such odors (at some times, to be sure, much more than others) cannot be avoided.

The committee have received both written and oral statements of the offensive odors from the drains, perceived upon the streets.

Some of those rooming in the west building complained of the heat, the steam and the odor which came from the laundry and penetrated the apartments.

Though some of the dormitories were small for the number occupying them, and were not provided with any special or artificial means of ventilation, yet they were as they had been in previous seasons of health, and during the summer could have been kept absolutely closed only a moderate portion of the time. Compared with other similar institutions, the crowding was not excessive.

The foliage about the buildings from shade trees and vines covering the verandas was considered by the committee as being in some cases excessive, and, as before stated, they recommended that a portion of it should be removed.

Bathing-rooms and tubs were provided in the building, though many did not use them, preferring to practise such ablutions as they could in their own rooms. We have no evidence that imperfections of the bathing apartments, if they existed, had anything to do with the sickness of the pupils.

Though the discipline of the school was strict, and the requirements for intellectual labor and application were not light, they did not differ from those of former years; were much like those of other schools of a similar character, and could scarcely be regarded as excessive.

The exercises of the gymnasium were taken for half an hour immediately before dinner four times per week, with no period of rest between such exercises and the forenoon of study and recitations; and some thought that their appetite and digestion were impaired by this; but the practice was the same as during previous years of freedom from fever, and we are unable to say that it had anything to do with the sickness.

To the subject of the diet of the institution, the committee, as was their duty, gave careful attention, but the facts their investigations elicited would not justify the statement that deficient or improper alimentation acted as a cause of the disease.

Maplewood is supplied with water, as is the rest of the village, from a mountain lake through the hydraulic works, and during the hot weather ice was used in that for drinking. For some days in July the supply from this source was scanty, and these grounds being higher than most of the village, there was a failure of the hydraulic water at the Institute. Water for cooking and drinking purposes was brought during this interval from a neighboring well—the same as used by several other families without injury or complaint; but the water for washing was supplied to the rooms from cisterns on the premises, which had long been unused, and complaints were made of its unpleasant odor. These complaints, however, were by no means general, and the committee have not sufficient facts to justify them in concluding that the water was in any way a cause of disease. The condition of this cistern water did not fail, however, to attract attention. It may be proper to state that one pupil, and one only, complained that, for a short time, the drinking water was not good.

Pleasure excursions were not unfrequently taken, by the pupils, about the neighboring country, in vehicles kept at the establishment for that purpose, and other proper recreations were allowed; and the pupils generally expressed themselves as having been treated with much kindness by the Principal and the teachers.

These the committee regard as all the material facts of a strictly local character having any important bearing upon the health of the inmates.

Which of these could have acted either as predisposing, exciting, or collateral causes of the deplorable results that have occurred?

To solve this question it will be necessary, first, to establish the character of the disease; then, to present, from the most reliable medical authorities, the causes of such form of disease; and, afterwards, to compare the facts in the case in hand with the authorities and established principles bearing upon it.

That the disease, in the mass of cases, was typhoid fever, or abdominal typhus, or, as called by Dr. Murchison and others, "pythogenic fever," there can be no doubt.

The committee all saw some of the cases, and one of their number attended several of them through their protracted course; and although no opportunity was presented to them for verifying the diagnosis by *post-mortem* examinations, and they are not aware of such having been made in any of the cases, yet the symptoms, though varied and in some cases peculiar, were so unequivocal as to cause fifty-six cases to be pronounced typhoid fever by quite as many different physicians, without any previous concert or understanding. In some of the cases there may have been, and indeed there appeared to have been, a malarious element, and following a present custom, such might have been styled "typho-malarial"; but the whole history of the disease showed the typhoid to be the *predominant* element—the essential characteristic—and, without lengthening the report by entering into details of proof, the fact that the disease, whatever complications might have existed, was essentially typhoid fever, may be regarded as established.

It would be impossible to bring this report within reasonable limits, were we to discuss fully the various questions connected with the origin and propagation of typhoid fever. Although various theoretical views are held as to whether the poison producing the disease is generated in the bodies of the sick, and communicated from them to the well, or whether it is generated in sources exterior to the bodies of fever patients, yet all authorities maintain that a peculiar poison is concerned in its production.

Those who hold to the doctrine of contagion admit that, to give such contagion efficacy in the production of wide-spread results, filth or decaying organic matter is essential; while those who sustain the theory of non-contagion—the production of the poison from sources without the bodies of the sick—contend that it has its entire origin in such filth—in decomposing matter, especially in fermenting sewerage and decaying human excreta.

The injurious influence of decomposing azotised matter, in either predisposing to or exciting severe disease, and particularly typhoid fever, is universally admitted among high medical authorities. The views of Dr. Carpenter on this subject are too well known to medical men to need full elaboration. His doctrine, so clearly stated and so amply illustrated by facts, is that decomposing materials in the system, whether generated and retained there or taken in from without, either in water or food contaminated with foul matters, as

sewerage, &c., or in the air by night-soil and sewerage emanations, either themselves produce disease or serve as the nidus for the operation of specific or zymotic poisons, such poisons as produce fevers, cholera, diarrhœa, dysentery and the like.

After giving many other cases showing the effect of foul emanations in the production of fever, cholera, &c., Dr. Carpenter says:—

"The following case may be added in proof of the potency of an atmosphere charged with putrescent emanations in rendering the system liable to the attacks of zymotic diseases of various kinds.

"A manufactory of artificial manure formerly existed immediately opposite Christ Church workhouse, Spitalfields, which building was occupied by about 400 children, with a few adult persons. Whenever the works were actively carried on, particularly when the wind blew in the direction of the house, there were produced numerous cases of fever of an intractable and typhoid character; a typhoid tendency was also observed in measles, smallpox, and other infantile diseases, and for some time there prevailed a most unmanageable and fatal form of aphthæ of the mouth, ending in gangrene." Many deaths occurred.

"The proprietor of the manufactory was compelled to close his establishment, and the children returned to their ordinary health.

"Five months afterwards, the works were recommenced. In a day or two subsequently, the wind blowing from the manufactory, a most powerful stench pervaded the building. The night following, 45 of the boys, whose dormitories directly faced the manufactory, were again suddenly seized with diarrhœa; whilst the girls, whose dormitories were in a more distant part, and faced in a different direction, escaped.

"The manufactory having been again suppressed, there was no subsequent return of diarrhœa."

Dr. Williams, whose Principles of Medicine are in the hands of so many, in speaking of these sources of filth and foul air, says:—

"The soil which drains from habitations contains, in addition to excrement, dirty water, the washings and remnants of animal and vegetable matter used as food, and other offal. All these are mixed together and stagnant in the corrupting slough that is retained in cess-pools and privies, or that is carried into sewers. Every ill-drained house has a Pandora's box ready to pour forth its evils when occasion offers, and always oozing them out in degrees sufficient for the impairment of health.

"These materials continually poison both air and water; and typhoid fever, diarrhœa, cholera, dysentery, dyspepsia, inappetency, general weakness and mal-nutrition are the results of their pestiferous operation acting in different degrees."

Dr. Stramm, of Berlin, Germany, who has given many years of his life to the study of epidemic diseases in different parts of the world, believes in the possibility of annihilating nearly all such dis-

cases by proper attention to cleanliness and other hygienic measures. He says: "Before erecting statues, building museums, and buying expensive pictures, towns should be relieved of bad odors and fermenting putrescence;" and adds, "that good privies are far higher signs of civilization than grand palaces and museums of art." Among many other facts enforcing his views, he mentions that in certain wards of the Vienna General Hospital there was an epidemic of fever in the winter of 1862–63. In the wards on the second floor the disease prevailed by far the most extensively, and it was found that the pipes for the escape of gases from the cess-pools opened just above that floor in a garret which was quite closed. On proper ventilation the disease soon ceased.

From numerous instances, ancient and modern, Dr. Stramm concludes that wherever there is a bad odor there is, as a rule, *materies morbi;* and that when there are bad conditioned water-closets and cess-pools, poison will penetrate into dwellings, and when this is the case to the requisite extent, epidemics inevitably follow. He says that when the capital of Egypt was moved from Thebes to Memphis—from the upper country to the marshy lowlands, where proper drainage was impracticable, and where the infection of the air was carried on in an almost systematic manner—the empire gradually declined; and he quotes Baron Liebig in ascribing to the bad system of sewerage adopted at its capital, the fall of the Roman Empire.

Dr. E. D. Mapother, Professor of Hygiene, and Medical Officer of Health of the city of Dublin, says:—"Typhoid fever is about the most preventible of diseases, yet of this affection 140,000 cases occur, and at least 20,000 young persons, including many of the flower of the people, die every year in England." He attributes it to foul emanations, and says there is much greater risk of the disease being communicated from the decomposition of materials and the production of poison in faulty sewers, than from the atmosphere about patients; and urges the use of disinfectants, and improvements in the condition of sewers and privies as the preventives of this disease "born of putrescence."

One of the latest and perhaps the highest authority on this subject—Dr. Chas. Murchison, of the London Fever Hospital—has applied the term "pythogenic" (literally, "born of putridity") to typhoid fever; and so strong is the conviction as to the particular form of decaying matter most frequently producing it, that the name of "night-soil fever" has been given to it.

It is regarded by Murchison and others as an endemic disease—that is, as a disease belonging to, and consequently generated in, *localities*. It occurs more frequently, especially in New England, during the autumn, and it is often unusually prevalent after summers remarkable for their dryness and high temperature.

It is more likely to occur in youth and adolescence than in later periods of life, and is not so particularly increased as is typhus fe-

ver by intemperance, fatigue, overcrowding and deficient ventilation, or by poverty and deficiency of food—though all of these have some effect in predisposing to it.

The question whether typhoid fever is ever properly contagious, that is, whether the poison producing it is generated in the bodies of those sick with the disease and communicated to others, producing the like affection in them, has long been discussed, but is not yet fully settled. It is always difficult to say whether a disease is communicated by contagion from one person to another, or not, when both have lived in the same place and been subjected to the same general influences. Andral, perhaps the most accurate of French observers, declared that he had not seen typhoid fever exhibit the slightest contagious character; and Chomel stated that not more than one in a hundred, in France, where this has long been the prevailing fever, believed it to be contagious.

At the present time, professional opinion in France is more divided. Trousseau, whose authority is very high, regards it as probably contagious; but only so under peculiar circumstances—under certain special conditions, while he admits that many facts seem to point in the other direction. Lebert, one of the most recent and highest among German authorities, says that, within his large field of observation, he has found the abdominal typhus (typhoid) very little contagious; at all events, incomparably less so than the exanthematic, or English typhus proper; and less contagious in endemic cases than in wide-spread epidemics. He finds, especially, that whilst smallpox and typhoid patients are in the same hospital, every year, the typhoid convalescents take the smallpox, but the smallpox patients do not take the typhoid. He regards putrid and mephitic emanations as among the causes which have a decided influence in the production of the disease, and says:—"That local emanations from the earth, local injurious substances eluding our search, have not seldom a share in producing the disease, is proved by the fact that, sometimes, local causes of many years' standing cease to develope their injurious properties through hygienic improvements." He says, again:—"Too exhausting labor, together with poor dwellings and insufficient food, renders the system more susceptible."

Professional opinion in England and in this country is divided. Very few, however, hold that the disease is chiefly propagated by contagion. A very large portion contend that it is often generated spontaneously, or independently of the sick; and it has long been held, in a vague way, to be produced by poisons developed chiefly by animal decomposition, as malarial fevers so evidently are from changes in vegetable matter.

In this country, particularly, where the disease so frequently breaks out in a scattered population, where there is no possibility of contagion, nearly all believe that it is generated *de novo*; and it is inferred that if this is so in some cases, it is likely to be so in all;

as, very generally, when the disease occurs in one person, after another has had it in the same locality, both have been subjected to the same external influences, and may therefore have been affected by the same causes, one being affected only later than the other. Although almost universally held not to be generally produced by contagion, yet the spontaneous origin of typhoid fever has been regarded, until within not many years past, as involved in obscurity—its particular procuring cause having been looked upon as vague and uncertain. Emanations from sewerage and putrefying animal matters have long been considered causes of fevers, as has been seen; but it was reserved for Dr. Murchison to show, by a large collection of facts, that fevers produced by such emanations are always typhoid, and not typhus, and that such emanations are the common causes of such fevers. A few of the many facts upon which he based his conclusions may here be presented, some of them in a condensed form, as throwing light upon the questions which the committee have undertaken to investigate.

In August, 1829, of 22 boys in a school at Clapham, England, 20 were seized, within three hours, with fever, vomiting, purging and excessive prostration. One other boy had been seized with similar symptoms two days before, and died comatose, in 23 hours; another boy died in 55 hours, and the rest recovered. A careful investigation could detect no other cause than the opening and cleaning out of a drain which had been choked up many years, and which, when opened, emitted an offensive odor. This drain was at the back of the house where the boys were, and its opening was watched by them. Its contents were spread upon their play-ground. The symptoms and *post-mortem* appearances were those of typhoid fever.

In 1838, a circumscribed typhoid fever broke out in Birmingham, England. About 50 cases occurred in the immediate neighborhood of a small stream, which was nothing more than an open sewer. The preceding season had been very hot, so that the stream was nearly dried up, and in some places almost stagnant. It disengaged extremely fœtid odors, especially during the night, which were complained of by the inhabitants.

In the same year typhoid fever prevailed in the Commune of Prades, in the Department of Ariège, France. Of 750 inhabitants, 310 were attacked and 95 died. The cause was traced to a stagnant pool, which was the receptacle of dead animals and of all the sewerage of the district. The outbreak was preceded by damp, warm weather. Three times the pestilence returned, and always when the wind was blowing over the infected water.

Another circumscribed outbreak of this same fever occurred in an isolated farm-house in the thinly peopled county of Peebles, N. B., in 1846, as recorded by Dr. Christison. Every one of the fifteen residents was seized with the fever, and three died. Many of the servants who worked on the farm during the day were also affected,

but none communicated the disease to their families, who did not visit the farm. The cause was traced to the drains and sewers, all of which were found closed up and obstructed by the accumulated filth proceeding from the privies and the farm-yard, the effluvia from which was very offensive.

About Easter, 1848, a formidable outbreak of this fever occurred in the Westminster School and the Abbey Cloisters, in London. It produced a perfect panic in the neighborhood, particularly because of its central situation and because it affected "the better classes." Within a little more than eleven days it attacked thirty-six persons, three of whom died; and though so many less were affected and died in this case than at Maplewood, a large portion of the people of London, and indeed of England, were agitated by the event, and it has become classical under the name of the "Westminster fever." Shortly before its appearance there were a few days of peculiarly hot weather, and a disagreeable stench was complained of in the houses in question. It was found that the disease followed very exactly, in its course, the line of a foul and neglected sewer in which fecal matter had been accumulating for years, without proper exit, and which communicated by direct openings with the drains of all the buildings in which the fever occurred. The only exception was in the case of some boys living in a house at a little distance from those in which the drains opened; but they were in the habit of playing, every day, in a yard in which were gully-holes opening into the foul drain.

This case was minutely inquired into by the most eminent physicians of London, and the Metropolitan Sanitary Commission gave it as their decided opinion that the epidemic arose from the bad state of the sewers and drains of the precinct, and especially from the foul condition of the large sewer described.

In the autumn of 1852 a typhoid fever broke out in Croydon, England; and of a population of 16,000, 1800 were attacked and 60 died. The report of eminent medical men to the Secretary of State of England, who took official cognizance of the affair, showed that the escape of sewer miasm, through imperfections in the sewerage drain-pipes, had been influential in producing the epidemic.

In November, 1853, in Cowbridge, Wales, an outbreak of typhoid fever suddenly occurred, under very peculiar circumstances. Two balls had been held at the hotel of the town, and were attended by about 140 persons from all parts of the surrounding country; and, shortly after, at their homes, many of these persons were attacked, and none others, and eight died. Poison in the food or drink was suspected; but the persons were attacked too long after the event for this supposition; and an investigation revealed the fact that a foul privy was in a passage leading from the house to a stable, and the loft over the stable had been used as a supper-room at the ball.

The local origin of the disease was here completely proved;

though the emanations from the privy as the cause was not so completely demonstrated. Some condition about the stable may have contributed to the result.

In the autumn of 1857 enteric fever broke out in Fleet Lane, London, while a sewer was being constructed. The sewer was open from June 29th to October 30th, and, during all this time, the inhabitants complained of the offensive smell. Soon after the sewer was opened diarrhœa began to appear, and enteric fever followed. Of 140 families in the lane, hardly one escaped. Those who investigated the subject attributed the fever to sewer miasms. It appeared soon after the sewer was opened: it disappeared when the sewer was closed; and, during the whole of the time, it was confined to the lane and its immediate neighborhood.

In the fall of 1858 an epidemic of typhoid fever prevailed at Windsor, England. As occurring in the immediate neighborhood of one of the royal residences, Windsor Castle, it was made a subject of special inquiry by the Medical Officer of the Privy Council. Within four months 440 persons—about one twentieth of the whole population—were attacked, and 39 died.

The disease seized rich and poor alike, and the cause seemed clearly to be traced to the escape of sewer gases, through defects in the drain, into the residences of the people attacked. There was a separate sewer for the Castle, which was kept in good condition, and no case of fever occurred there. Places only a street apart, but supplied, respectively, from the defective town-drain, and the perfect Castle-drain, in the one case suffered severely, and in the other escaped entirely.

Foreign cases of this kind which have found places in the books and journals, showing the influence of foul emanations in causing typhoid fever, might be multiplied; but these, abstracted and condensed, as already intimated, from Dr. Murchison's recent and almost exhaustive treatise on the Continued Fevers of Great Britain, will suffice.

Unfortunately, we have too many experiences in our own country, confirmatory of the conclusions to which the foregoing facts so strongly tend. The National Hotel disease, which occurred at Washington, at the time of Mr. Buchanan's inauguration as President, in 1857, is fresh in the memory of many. A large number of guests of that popular hotel were seized, almost simultaneously, with a disease in some respects peculiar, but essentially an intestinal or enteric fever. Poison was suspected, but a rigorous investigation brought the committee appointed for the purpose, and all the medical attendants upon cases, to the belief that the disease was due to sewer gases. The drain of the privy was found to be obstructed; and the foul emanations were driven back, poisoning many who inhaled them. On removing the obstructions, the effluvia and the cause of the disease disappeared.

In such emanations, the gases most familiar to chemists and most offensive to the senses, are sulphuretted and carburetted hydrogen; but, mingled with these, and sometimes independent of them, are various other substances less defined and appreciable—matters in the process of fermentation and decay, and probably containing living germs of low organization. These obscured elements, substances perhaps destitute of odor, enter the system sometimes unperceived, mingle with the blood, and, by their presence there, induce changes in the fluids and make impressions upon the solids which create the phenomena of disease. These subtle elements may be produced without the more perceptible and offensive gases; and hence the absence of odors may not prove the absence of poisonous emanations. Still, offensive odors are usually present.

Not only are these poisonous elements taken into the system in the air respired, but they are quite as effectual when taken into the stomach, mingled with ingested water. The cases are numerous where water, contaminated with faecal and drainage matter, has been the cause of typhoid fever and allied diseases. The following are some of them:—

Richmond Terrace, Clifton, is a crescent composed of thirty-four houses. In 1847, the inhabitants of thirteen of these houses drew their drinking water from a well at the end of the crescent. The remaining houses were supplied with water from another source. At the end of September the water of the well gave evidence to the taste and smell of being tainted with sewerage. Early in October typhoid fever broke out, nearly at once, in all the thirteen houses in which the tainted water had been drunk, but did not make its appearance in any of the other houses. In almost every one of the thirteen houses two or three persons were ill, and in some a much larger number. The houses in which the fever broke out were far apart in the terrace, and there was little or no intercourse between their inmates—the water from the well being the sole connecting link.

The following is a case even more conclusive, if possible, than the foregoing, in demonstrating the production of typhoid fever from foul matters—from a defective drain soaking through a porous soil into a well, and thus contaminating the drinking water. This case occurred in Williamstown, Mass.; and as the facts have never been presented in the literature of the profession, a somewhat detailed statement will be given. Besides having had oral accounts from various entirely reliable sources, the committee have received full and separate written statements from three parties: one, a very intelligent physician who attended many of the cases; and the other two, sufferers from the disease—one now an advanced student of medicine, and the other of law. One of the committee has also visited the place and examined the premises concerned.

From the statements it appears that, about the middle of June,

1860, typhoid fever broke out in a boarding house. The whole number sitting at the table was from thirty to thirty-five persons—mostly students of Williams' College. In the course of two weeks the greater portion of these boarders were affected—twenty or more of the students falling sick.

Dr. S. Duncan, one of the physicians who attended the cases and made the investigation, says, in his communication:—

"On the 18th of June, 1860, I was called to visit, professionally, one of the boarders, and found him suffering with the initiatory symptoms of typhoid fever. At this time there was, to my knowledge, but one case of fever in town. The patient was removed from his lodgings in the College to this boarding house, for the sake of greater convenience in care and treatment, and continued to use the water from the well on the premises for at least ten days from the first visit.

"This patient was under treatment for about six weeks; and though having, at times, unfavorable symptoms, he at length recovered. About the last of June the cases began to multiply rapidly among the boarders; and, as the disease had not made its appearance in the town, the conviction was forced upon my own mind that its origin was local, and that a solution of the problem might be found by an examination of the premises. The building, cooking apparatus, and, in fact, the whole house, was minutely inspected, without discovering any cause for the sudden development of the disease; but out of doors was found what was thought, at the time, to be a satisfactory explanation of the phenomena.

"A drain, which received all the refuse of the house, was found to be choked near its exit into another drain, which conveyed surface water from a highly cultivated field, and which also ran near the well. The season was uncommonly wet, and the earth in the immediate neighborhood of the well was so completely saturated with organic matter that it oozed through the ground and stood in pools of putrescence on the surface. Nearly two thirds of the inmates sickened; and though the cases differed in severity and duration, yet all presented the unmistakable phenomena of typhoid fever. There were no deaths! Among the boarders were a number who did not drink the water *at dinner*, and of these it was remarked that not one sickened! The family of one of the professors of the College, living in an adjoining house and using water from this well, sickened like the others; the professor, who drank no water at dinner, alone escaped. I am tolerably familiar with typhoid fever, and have never had a doubt that the disease appearing at that house, and which was associated with drinking that water, was typhoid fever All that drank the water unboiled had the disease; all who avoided it in this state, escaped. It appeared that the action of heat rendered the water innocuous, either by volatilizing, coagulating, or otherwise changing the organic matter."

Though several of the students, after becoming ill, went to their homes and suffered their sickness, no case is mentioned of the disease having spread from them to others.

One of the other gentlemen, in his communication, says:—

"We thought the illness was from the water—

"(1) Because of the drain so emptying that the foul water ran directly into the well from which we drank.

"(2) Because, of some thirty or thirty-five boarders, all at the same table, those who drank tea and coffee, exclusively, three times a day (and there were several such), escaped all symptoms; as well as those who took ale for dinner, and tea and coffee at the morning and the evening meal.

"(3) It could not have arisen from impure air, study, or epidemic influence, as none in the town were affected save parties who used the water; and many who were sick were among the *laziest* of students.

"(4) Those were the subjects of the severest sickness who were, exclusively, drinkers of water. One of the sick, who never used any other drink, was confined eight weeks, and was unable to fill his appointment on commencement day.

"Another, who drank water moderately, and only at dinner, had the disease in a much milder form, and was confined a very much shorter time."

This gentleman, the writer of the account, was seized on the 25th of June, and he says:—

"At, or within a day or two previous to and after, my illness, several of the boarders were seized with similar symptoms and sent home."

From these dates it appears that the cases continued to occur from near the time of the attack of the first, until all were affected. Some resisted the influence of the water longer than others, but all were taken within a period of ten days. The water, when carefully noticed, was found to taste and smell of the sewerage; though when served upon the table with ice, these qualities were not perceived.

Although this poison is sometimes conveyed to the system through the medium of drinking-waters, yet in most cases it is taken through the air. Says Dr. Murchison:—"Many instances might be cited where, although the water supply was the same to all, only those persons exposed to sewer emanations have been attacked."

The intimate connection between typhoid fever and night-soil, sewer-emanations, or contaminated drinking-waters, is now so generally recognized by the more enlightened members of the profession, that, so far as they are concerned, some even of these citations might have been omitted; but so much ignorance prevails in the community at large on this subject, that these references to facts and authorities are deemed necessary for the purposes of this report.

Nothing can be more important to the hygienic interests of the

community than that it should be distinctly understood that the connection between the causes referred to and the effect—between these forms of filth and fever—is so close and constant, and these causes are so much under control, that, as has been remarked by several recent French writers, "these fevers can, so to speak, be produced or prevented at will."

It is not alleged that the peculiar poison which produces typhoid fever is generated in every form of animal matter undergoing decomposition, or that it is present in every putrid odor.

It is probable that the special poison is produced only under somewhat peculiar circumstances, or when a particular kind of fermentation takes place in these foul matters; and unless the amount of fermenting material is very abundant, and the change rapid, the poisonous matter is carried off in the air as fast as formed, and is farther changed, oxidized and destroyed. Especially is this the case where free ventilation is allowed. But nothing which is the subject of inferential proof seems more certain than that, not unfrequently, such poisons are produced; and when abundant, or pent up, and then conveyed to human lungs or into human stomachs, operating either as essential or predisposing causes, effects such as have been described are produced—typhoid fevers are engendered. No one doubts the existence of a peculiar poison producing agues, or the conditions usually producing such poison; yet it is appreciable by none of the senses, and has been detected by no chemical tests. The proof of its existence is inferential, from the conditions and effects observed; and a knowledge of the existence of a typhoid poison and the conditions of its existence, are arrived at in the same way.

These views of the origin of typhoid fever have been objected to on the ground that, if true, the inhabitants of most European continental cities, and particularly those of Paris, would be continually laboring under an epidemic of the disease, as their *cabinets d'aisance* are so frequently filthy and offensive. It may be proper to repeat, and must be borne in mind, that it is not claimed that all filth of this kind is capable of inducing the disease, but that certain conditions of fæcal and sewerage fermentations have such capability. It should be farther understood that all persons are not equally susceptible to the influence of any poison, and there are various zymotic poisons to the influence of which many persons are not susceptible at all. However exposed, a large portion of the human family are never affected by the poison of scarlet fever; and there are others upon whom the yellow-fever poison, and marsh malaria, will produce little or no effect. There are different degrees of original susceptibility to typhoid poison—age and other less appreciable conditions exerting a decided influence.

Again, poisons slowly introduced and habitually present in the system, often fail to produce their ordinary effects. This fact is the

basis of *acclimation*—of becoming accustomed to a malarious or otherwise injurious climate so as to escape its diseases. It is a well-established principle in etiology, that recent residents are much more subject to endemic diseases than the older inhabitants. The Negro race, from being exposed all their lives, and through a series of generations, to the malaria of African jungles or Southern rice-fields, resist influences which would cause those not thus acclimated to speedily succumb. On the same principle, many Germans endure an amount of beer and tobacco that would be destructive to those not having their long training to these indulgences—a training in their own persons and in their ancestors. All are familiar with the tolerance established by habit in the use of opium, arsenic, &c. The principle would admit of indefinite illustration. The Parisians have been accustomed, to a certain extent, to these odors and influences all their lives and through a series of generations. They may have become to this extent acclimated to such an atmosphere. Such is not the case with all—with but few in this country of broad spaces and more cleanly habits. Such, we will venture to say, was not the case with the young ladies attending the Maplewood Institute. Hence their greater susceptibility.

But, notwithstanding this principle of acclimation, typhoid fever is the prevailing fever of Paris and a large portion of the Continent, while it is much less frequent in England, where this kind of cleanliness is more regarded. In Great Britain, where crowding and deficient ventilation, bodily filth and starvation are more prevalent, *typhus*, not typhoid fever abounds.

In view of the state of things at Maplewood, and of these facts and admitted principles of science, what shall we conclude was the cause of the *Maplewood fever*?

Those who have followed the current of the preceding statements, will be ready to anticipate the conclusion to which the committee have been brought.

They are of the opinion that the disease at Maplewood essentially originated in the state of the privies and drainage of the place; the high temperature and other peculiar atmospheric conditions developing, in the organic materials thus exposed, a peculiar poison, which accumulated in sufficient quantity to pervade the whole premises, and operated a sufficient length of time to produce disease in young and susceptible persons, rendered more than usually impressible, probably, by the protracted heat of the summer and the severity of their labor, and, possibly, by other influences belonging to the season and to their peculiar conditions.

The reason of this opinion will, perhaps, appear more plainly by a review and more minute statement of the facts in the case, and a comparison of these with the other facts and with the etiological principles already adduced.

The morbid influence pervaded every part of the premises where

the pupils roomed, but did not manifest itself quite equally in all. It showed rather more of its effects nearest the chief sources of the effluvia.

The following table shows the number of pupils rooming on each floor of each building; the number sick on each floor, just before, at the time, or soon after the close of the school; the number sick with *fever* at the same time; the number of deaths in the building and the number dying away; the percentage of sickness; the percentage having fever and the percentage of deaths of the cases of fever.

Rooming in East Building.	No. of Occupants.	No. of Sick.	No. sick with Fever.	No. of Deaths.	Deaths in Buildings.	Deaths out of Buildings.	Per cent. of Sickness.	Per cent. of Fever.	Per cent. of Deaths by Fever.
Second Floor - - - -	20	17	12	1	1		85.00	60.00	8.33
Third Floor - - - -	21	21	16	4		4	100.00	76.19	25.00
Total - - - - - -	41	38	28	5	1	4	92.68	68.29	17.85
West Building.									
First Floor - - - -	10	9	9	4	1	3	90.00	90.00	44.44
Second Floor - - - -	11	10	7	1	1		90.90	63.63	14.28
Third Floor - - - -	12	9	7	3		3	75.00	58.33	42.85
Total - - - - - -	33	28	23	8	2	6	84.84	69.66	34.78
Total of both Buildings	74	66	51	13	3	10	89.18	68.97	25.49

From this tabular statement, which may be seen at a glance, but which is worthy of careful study, and which the committee have been able to make only after most extensive inquiries, continued for some months and involving a correspondence with about a hundred persons, it will be seen that the percentage of the number of cases of sickness in the east building is greater than that of those in the west; the percentage of fever, however, was greater in the west building, and the percentage of mortality much greater there. By referring to the diagram of the grounds, it will be seen that the west building was more exposed to faecal effluvia, by the closer proximity of one of the privies, and by the hall being directly connected with it by a covered passage; and the testimony of the pupils and their friends shows rather more complaint of the odors in the west building than in the east. On the other hand, the east building was much nearer the site of the old barn and the offensive pool near the opening of the kitchen drain; and the privy on the east side of the chapel, though not communicating directly with the hall, yet indirectly, through the corridor, was represented as being, a part of the time, in a peculiarly bad state. This is the one which was cleaned out one night, producing the odor said to be so intense.

The classes reciting in the "Cabinet," a room on the first floor of the chapel building, near the privy, are reported as being often much annoyed by the odor, especially when the windows were open.

But, as before stated, the whole premises seemed involved in an atmosphere impregnated with morbid materials and influences. Indeed, a fact which has not yet been alluded to, but which must be stated, in order to give a complete view of the case, seemed to indicate that the morbid influence was not entirely confined to the grounds of Maplewood. In a well-appointed dwelling, directly west of the premises, on the opposite side of the public street, two cases of typhoid fever occurred, and several other members of the family suffered from other forms of ill health, accompanied by decided derangement of the stomach and bowels; and some of the members of a family in an adjoining house were reported to have suffered from some similar form of disease. These houses were the nearest of any to the buildings of Maplewoood. In the other direction there were no dwellings for a considerable distance. Besides, the winds during July tended to carry effluvia westward. No record of winds was kept at Pittsfield, so far as the committee could ascertain; but in one of the communications from the physicians, it was stated as the impression of the writer that easterly winds prevailed during this period; and from a record kept at Williams' College, some twenty miles north, we find that: "In July the wind was east, or northeast, on the 2d, 7th, 10th, 14th, 16th, 17th, 18th, and 25th; but from the 14th to the 18th there was scarcely any wind. The succeeding week was smoky."

Absence of winds was, doubtless, the worst condition for the inmates of Maplewood. Strong winds would have tended to carry away and dissipate the vitiated atmosphere.

As to the amount of influence which the different degrees of crowding exerted in predisposing to attack, the facts are not sufficiently numerous to determine. The following, however, may be taken for what they are worth.

In the west building three lady teachers roomed—one on each floor. On the first and second floors they roomed alone and remained well. The one on the third floor roomed with a pupil, her sister, and both died after returning to their home. The southeast corner-room of the west building—first floor—was occupied by three pupils. One died, and both the others had the fever severely. In the east building three teachers roomed, all in separate apartments. Of the two who were on the second floor, one had very severe typhoid fever and the other was not sick. The one on the third floor escaped the fever. Most of the rooms in both buildings were occupied, each by two pupils; and generally there was little difference in the crowding or the ventilation.

The circular sent to the physicians of Pittsfield, a copy of which was given in the early part of the report, was responded to by sev-

en—replies not having been received from two or three. Six of the seven very nearly coincide in their views as to the nature and cause of the disease. They regard it as a continued fever of a somewhat peculiar variety, but of a typhoid type; and express the opinion that the chief causes were local in their character, mentioning, as the most efficient, the condition of the privies and the drains, as already described, and the removal of the old barn and pig-sty, thereby exposing to the extreme heat a soil abounding in organic matter, much of which had before been covered. Deficient ventilation, deficient sunlight (by one), and rumored uncleanliness and want of ventilation of the cellars were mentioned by two, as probable accessory causes. The propagation of the disease by the earlier cases, occurring in an atmosphere containing so much decomposing material, was also spoken of by two, as aiding in accounting for its great amount. Some of these letters contain specifications in regard to the hygienic conditions of the place, and refer to various items of testimony as to odors, &c.; all of which, taken with many other statements, has had its weight in determining our opinions respecting the cause of the disease.

One of the replies takes a somewhat different view from the rest as to certain features of the disease which occurred at Maplewood, and as to the more efficient causes producing it. Although this communication stands alone in some of its positions, yet the high source from which it emanates, and the plausible views which it presents, give it a right to careful and respectful attention. From its taking positions not quite in harmony with the rest, or with the conclusions to which the committee have arrived, they feel called upon to present and consider its statements more at length.

The writer expresses the opinion that the disease at Maplewood was largely, if not chiefly, due, in its origin, to a general wide-spread malarial influence engendered by the heat and drought of the season, lowering the streams and ponds, and exposing surfaces to the sun usually covered by water; and he dwells with much emphasis upon the fact that about the time of the commencement of the disease at the Institute, there were various other attacks in the community of a severe character, febrile and intestinal, some cases of cholera morbus proving speedily fatal; and it is also stated that many of the cases, not only in Pittsfield, but in neighboring towns, furnished evidence of a malarial character by yielding readily (and as it was thought they otherwise would not have done) to free doses of mercury and other cathartics, followed *early* by large anti-malarial doses of quinia. From these and other considerations he concludes that the disease at Maplewood was "typho-malarial fever," and the result of a combination of causes rather than of any foul conditions of the surroundings of the institution.

That a general influence arising from the causes referred to actually existed, the committee have no doubt, but as totally irreconcila-

ble with the conclusion that the disease at Maplewood was caused by such general influence is the fact, that in Pittsfield and its vicinity, outside of the institution, typhoid fever did not prevail, or any disease having the specific characteristics of the terrible scourge occurring there. The testimony on this point already given is conclusive. The exemption of the community cannot have been due to any particular treatment, as they had every variety, from heroic to infinitesimal doses: certainly it could not have been due to large doses of quinia, as but a small proportion of the people or of those attacked with any form of disease took such doses. Nearer the lowered streams and dried marshes than Maplewood, were several large manufacturing establishments, with boarding houses for operatives, where the crowding must have been at least as great, and other personal conditions certainly no better than at the Institute; but in none of these did such a disease prevail. It is presumed their local surroundings were different. These considerations were not ignored by the author of the letter under consideration, for he says: "of the existence of local causes at Maplewood no one can doubt." He, however, adds:—

"There are very few public or private dwellings in and around which the hygienic conditions are perfect, and in such a season any such cause is intensified to its maximum; but that there was any *extraordinary* local cause, in this instance, I have never been able to satisfy myself. These girls, many of them feeble and nervous, all of them worn down by excessive labor in preparation for the anniversary exercises, these labors constantly increasing in severity as the end of the term approached; appetite and sleep failing them, and panic-stricken as they were at the occurrence of so much sickness, and at the deaths, were certainly fit subjects for fever-poison to operate upon in its worst forms.

"The rooms are very small, all opening into a common, narrow hall, with no opportunity for ventilation, except through the one window of the room and the door into the hall, and the latter having no direct ventilation. With the extreme heat and remarkable absence of winds at the time, it was *impossible* to secure anything like thorough ventilation, and to avoid the constant impregnation of the air with the breaths and exhalations of the fever patients, and especially those from the abundant and very offensive alvine discharges. In this air these girls lived, day and night, and my opinion is, that a large majority of the cases occurring after the close of the school were the result of *contagion*, or *infection*, from the first cases, rather than from any extraordinary cause of a different nature."

This brings clearly into view the question of contagion, which must be judged of in the light of the facts and the citations of professional opinions already given in a former part of the report, and by the peculiar circumstances of the case in hand.

The first attacks occurred during the last days of July, and the

deaths in the buildings, from the 2d to the 10th of August. There was, then, time for the communication of the poison from these to the rest.

The labor of preparing for the approaching anniversary exercises, though undoubtedly exhausting, was only a repetition of that of previous years, when the ordinary health prevailed, and of itself cannot be considered responsible for the production of such a prevailing and specific disease.

The statements respecting want of ventilation, excessive labor, &c., though somewhat stronger than the committee, from their information, would have felt justified in making, are yet, it is to be feared, too near the truth; and if ventilation was as deficient as represented, it must have contributed fearfully to the retention and concentration of any poison, whether arising from the bodies of patients or generated in other sources.

Especially would this circumstance have given concentration to a poison originating in the privies and conveyed to the narrow halls and the dormitories, through the covered corridors connecting these places, as well as to that received through the windows from the outer air.

The servant girl, the first patient who died of fever, spent the first few days of her sickness in a room on the ground floor of the gymnasium, and was then removed to the detached building marked "Cottage" in the diagram. Her evacuations were thrown into the privy east of the chapel. One pupil who died, and the teacher who recovered, were sick in the east building, and their excreta were deposited in the same place.

The other two pupils who sickened and died in the Institute, were in the west building, and their discharges were disposed of in the privy of the west building. None of the discharges, except in the case of the pupil who died in the east building, were in any way disinfected. In each case they were removed from the room soon after being evacuated, except when this occurred late at night, when, in some cases, they were kept covered in the room until morning.

As the inmates were all more or less within the possible influence of these excreta, all resorting to one or the other of the privies, there was opportunity for receiving the contagion from this source, if it was capable of conveying it.

All within the two buildings were likewise within the possible influence of exhalations from the breath and the surface of the sick. So much can be said for contagion as a cause, in the later cases.

But it is not claimed that the early cases were produced by contagion; and as all were in a similar state, subjected to the same conditions and breathing the same tainted atmosphere with the first, why might they not have been affected by the further persistence of the same cause? Is it not more likely that they were? In several of the cases cited from the authorities, the attacks of large numbers

were so simultaneous as to exclude the possibility of contagion from one to another; and in other cases, as in Richmond Terrace, other circumstances forbid the belief in the agency of contagion. Does not the case at Maplewood strikingly resemble those cited, where contagion could not be considered as playing a prominent part? If the family on the opposite side of the street were affected by the influences at Maplewood, was that more likely to be from emanations from the persons, or from a poison abundantly produced on the grounds? Two patients from Maplewood were sick with fever in a house where there were several persons of susceptible ages, and though no special precautions were taken, the disease was not communicated. Two sisters, day-scholars at Maplewood, took the disease and were ill at the same time, in the same house, with other members of the family of a susceptible age; but no others took the disease. Of nearly fifty who took the disease at Maplewood, and suffered from it long and severely in the families of their homes, the disease could not, in a single instance, be regarded as having communicated its poison to others. Not a case of similar sickness occurred in the neighborhood, excepting in a single instance. One young girl, a sister of a Maplewood pupil who had the fever, suffered, not long after, from typhoid fever; but one such instance occurring among the hundreds that must have been exposed, must be regarded as only casual. Two mothers of young ladies who died at the Institute, one from Rochester, N. Y., the other from Vermont, came to Maplewood to be with their daughters, each remaining about one week. Both of these ladies had the fever severely soon after they returned home.

All these facts certainly point towards the local origin of the disease, independent of contagion. Still the possibility of contagion is not denied. Especially is it not denied that the fæcal evacuations from the fever patients, mingled with other large fæcal accumulations, may have contributed to the production of a poison more virulent than that existing before; but all experience shows that, admitting a contagious poison, a polluted atmosphere, the presence of decomposing matter is necessary to give that poison wide-spread effects.

It has been urged as an argument against a local cause, but not from any professional source, that a similar condition of privies and drains had existed at Maplewood for years, while no severe sickness had occurred. Although these conditions may have been similar, they were not identical. Time had certainly allowed of further accumulations, and had effected changes. It is the "last straw that breaks the camel's back;" and besides, there had not been, before, the intense heat and drought of the past summer. This argument, as well as many others, suggested by a laudable sympathy for the Principal of the Institution, may and does diminish the weight of his responsibility, but does not impair the scientific conclusions as to the cause of the disease. The argument in favor of a special lo-

cal cause seems conclusive, unless the existence of the local impurities described be disproved. This the committee deem impossible: for no amount of negative testimony can overbalance the positive evidence of such a cloud of witnesses as have testified in the case.

Though fully admitting that few public or private dwellings are, in their internal arrangements or outward surroundings, in a perfect hygienic condition (and hence so many cases of comparatively isolated zymotic diseases everywhere), still, the committee cannot but think that the condition of the drains and their openings, as described, and particularly of the two privies (used by a family of more than 110 persons), consisting of superficial vaults without any kind of drains, and filled to overflowing in extremely hot and dry weather, and withal so near, and so intimately connected with the recitation and study-rooms, and the badly ventilated dormitories of so many girls, is something *extraordinary*, and, certainly, *local*.

In the communication above mentioned, much stress is laid upon the general causes of the disease having pervaded the whole region; that is, the heat and drought, which reduced ponds and streams, and generated a general malarious influence, producing at Maplewood a typho-malarial fever.

Without in the least denying such an influence, it is sufficient for the due appreciation of its effects in producing the sickness at Maplewood, to re-state the fact (and repetitions on so important a point seem justifiable) that, though for a few days it produced other forms of severe disease, it did not cause a prevalence of typhoid fever in other localities in the neighborhood. The testimony is uniform, that typhoid fever prevailed in Pittsfield, outside of the influence of the Institute, to a less extent—certainly not to a greater extent—than usual at the same season of the year. We must, therefore, conclude, that, though a general influence may have contributed to the production of disease at Maplewood, as elsewhere, yet, that that general influence was modified in its effects by local causes, and those not of an ordinary character, to have produced such results.

Whatever theoretical view of the subject be taken, the conclusion is the same—that the local sanitary conditions of the place must be, mainly, held responsible for this painful calamity.

In prosecuting this investigation, the committee have had but one object, and that was, to ascertain the exact truth, both as regards the character and amount of disease which occurred, and the causes which produced it. To this end sufficient time has been taken to exhaust every source of information, and also to allow of the abatement of the force of first impressions and the subsidence of feelings necessarily excited by the reception of so many communications abounding in the strong expressions of wounded paternal affection, or in the agonized outbursts from the lacerated hearts of mothers who, like Rachel, were mourning for their children, and would not be comforted.

They have endeavored to give due heed and the proper weight to every fact and suggestion bearing upon the subject; and have striven to pursue, impartially, every plausible train of thought, to whatever conclusion it tended. They have endeavored, in this report, to meet frankly every suggestion opposed to their opinions, and to deal fairly with every view.

In performing their task, the committee have been engaged with hygienic conditions and events. With persons, and motives, and responsibilities, they have nothing to do.

It may be said, however, that, of course, the subject was not understood and regarded, by those responsible for the condition of the place, before the sad results had occurred, as the committee now understand and regard it, otherwise, upon every principle of self-interest and the most ordinary sentiments of humanity, precautionary measures would have been taken.

It is alleged, and, without doubt, truthfully, that various improvements which have since been made on the premises, were in contemplation for some time previous to the sickness, and were delayed chiefly in consequence of an expected change in the proprietorship—that previous experience of a similar condition of things had suggested no danger—that even after the disease commenced, medical advisors did not at first recognize any local causes—and that, above all, no such season as the last had before occurred; and further, that the contemplated changes could not well have been effected when the school was in session. All this and more could undoubtedly be truly said in defending whoever was responsible for the condition of the premises from the suspicion of intentional wrong, or reprehensible indifference and neglect; but this is not our task. These considerations did not alter results; and in view of such results, it cannot be too much regretted that the contemplated improvements were so long delayed.

To whatever extent the ignorance of sanitary laws may shield the violator from moral responsibility, it will not abate the physical penalty of such violation. This will fall with the same force upon the unconscious, the ignorant, the helpless and the morally innocent, as upon the intelligent, the powerful and the wicked. It is too much the custom to attribute all cases of sickness and death, however palpably the result of violated laws, to a special mysterious Providence, or to the decrees of fate—forgetting that without a miracle all natural events are the results of natural causes; and that over such causes men have often control. Though there is a Providence over all, it should be remembered that, in the world of nature, that Providence operates in accordance with, and by the means of established laws. Though the hairs of our head are all numbered, and not a sparrow falls to the ground without our Father's notice, yet the number of our hairs is determined by the fixed principles of

our organization, and every sparrow which falls to the ground does so in accordance with laws established at the dawn of creation.

To prevent the poison of typhoid fever, when taken into the system, from producing its legitimate effects, except by natural agencies, would require as positive a miracle as to restore a severed head, or arrest the course of the heavenly bodies in their spheres. Instead of closing our eyes and soothing our minds by casting the responsibility of a great calamity upon Providence, we should look to the physical conditions producing it, and see whether those conditions are removable; or whether the consequences, by human foresight and agency, could have been prevented. Until this is done more generally and more effectually than heretofore, such calamities will continue to occur.

The case of Maplewood is not the first in the history of similar institutions in this country, and it is feared it may not be the last. The committee have information of others, though they have not authentic knowledge of sufficient details to make them available in a report intended to be full and exact in its facts and rigid in its deductions. The chief object of this report is, by an exhibition of the truth, to prevent similar calamities in the future. In this view and with this object, all personal and local considerations sink into insignificance, and must not be allowed, as they have not been, to obscure the truth.

Knowing the great interest which this matter had excited, and anticipating the attention which might be given to the facts and principles developed, and their possible influence upon the preservation of health and life in other cases, the great responsibility of this undertaking has been appreciated.

The importance of the subject has been deemed sufficient to justify so extended a report; and the conclusions to which the committee have come, together with the data upon which they are based, are submitted to the judgment of an enlightened profession and a discerning public.

The lesson for all, for the future, is too obvious to need further pointing out; and the committee cannot doubt that they would hazard little in predicting that the wisdom obtained by this sad experience will be of value in the future management of this institution, and secure precautions which will forever prevent the recurrence of such a calamity.

If the lesson shall be heeded by other institutions, and, to any extent, by the people at large, those who have been engaged in thus presenting it will be more than compensated for their labor.

Signed, A. B. Palmer, M.D.
C. L. Ford, M.D.
Pliny Earle, M.D.